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EXAMINER	
CONNELLY CUSHWA, MICHELLE R	
ART UNIT	PAPER NUMBER
2874	

DATE MAILED: 05/20/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/008,469	JOSEPH ET AL.	
	Examiner	Art Unit	
	Michelle R. Connelly-Cushwa	2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4 and 7-12* is/are rejected.

7)☒ Claim(s) *2,3,5,6 and 13-20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 November 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *4* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Information Disclosure Statement

The prior art documents submitted by applicant in the Information Disclosure Statement filed on March 26, 2002 have all been considered and made of record (note the attached copy of form PTO-1449).

Drawings

Seven (7) sheets of formal drawings were filed on November 9, 2001 and have been accepted by the Examiner.

Specification

The disclosure is objected to because of the following informalities:

On page 11, line 18, "second layer 12" should be –second layer 11--; and

On page 12, line 1, "stepped surfaces 11" should be –stepped surfaces 12--.

Appropriate correction is required.

Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 102

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by DeJule et al. (US 5,317,445).

Regarding claim 1; Figure 1 of DeJule et al. discloses an optical switch comprising:

- first and second layers;
- a plurality of inputs channels (M_1-M_4) in the first layer;
- a plurality of output channels (L_1-L_{12}) that may be located at an elevated level depending on the orientation of the switch;
- a matrix of deflection nodes ($B_{1,1}$, $B_{1,2}$, $B_{1,3}$) on the first layer to deflect incoming incident beams (K_1-K_4) traveling in a first direction from the plurality of input channels in a second direction toward the second layer; and
- a plurality of deflection elements ($B_{3,1}$, $B_{3,2}$, $B_{3,3}$) on the second layer to deflect the beams in a third direction through free space toward the plurality of output channels (L_1-L_{12}).

Claims 1 and 4 are rejected under 35 U.S.C. 102(e) as being anticipated by Street et al. (US 6,549,691 B1).

Regarding claims 1, 4 and 7; Figure 1 of Street et al. discloses an optical switch comprising:

- a first layer (128);
- a second layer (136);
- a plurality of input channels (104);

- a plurality of output channels (160) at an elevated level relative to the input channels (104);
- a matrix of deflection nodes (124) on the first layer (128) to deflect incoming incident beams (120) traveling in a first direction from the plurality of input channels (104) in a second direction toward the second layer (136); and
- a plurality of deflection elements on the second layer (136) to deflect the beams in a third direction through free space toward the plurality of output channels (160);
- wherein the deflection elements (124) in the first and second layers comprise a plurality of passive mirrors;
- wherein each input channel includes an optical fiber (104) and a collimation lens (112) aligned along an input axis.

Claim 12 is rejected under 35 U.S.C. 102(b) as being anticipated by Tanaka et al. (JP 04-009823).

Regarding claim 12; Figures 1 and 4 of Tanaka et al. disclose an optical switch comprising:

- a first layer (5) having a plurality of input/output channels (4) extending in parallel orientation along an input/output axes;
- a second layer (3) comprising a plurality of input/output waveguides (1), each output waveguide comprising a collection channel (11), a plurality of transition channels (14-10), and a plurality of ramps

connecting the plurality of transition channels (14-10) with the collection channel (11), the collection channels (11) of each of the plurality of output waveguides (1) extending in parallel orientation along output axes, the plurality of transition channels (14-10) extending from the collection channel along the input axes in parallel orientation with the plurality of input waveguide channels (4); and

- a coupling matrix layer (8) interposing each of the plurality of transition channels and the plurality of input waveguide channels forming a matrix of transition nodes (14-13, 6).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 7-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over DeJule et al. (US 5,317,445) in view of Bellman et al. (US 2003/0031409 A1).

Regarding claims 7 and 8; DeJule et al. discloses all of the limitations of claims 7 and 8, as applied to claim 1 above, except for each input channel comprising an input fiber and a collimation lens aligned along an input axis, wherein the fiber and lens are contained in V-grooves formed in an input block. DeJule et al. teaches that the light signals received at the inputs (M_1-M_4) of the switch are externally derived linearly polarized optical signal beams (see column 3, lines 44-45), but does not specify or

specifically teach how the light signals are directed to the inputs of the switch. Therefore, one of ordinary skill in the art would have recognized that any known, commonly used means could be employed to direct optical signals to the inputs of the switch. Optical fiber arrays are commonly used to direct optical signals to inputs of switches. Bellman et al. discloses an optical fiber array comprising optical fibers (16) and lenses (18) for reducing loss of light coupled into or out of the optical fibers by focusing/collimating the light, wherein the optical fibers and lenses are contained within V-grooves on stacked plates/blocks. One of ordinary skill in the art would have found it obvious to use the array of optical fibers disclosed by Bellman et al. to efficiently couple externally derived light to the optical switch disclosed by DeJule et al.

Regarding claim 9; DeJule et al. discloses all of the limitations of claim 9, as applied above, except for specifically stating that a linear polarizer is positioned prior to the inputs of the switch, along an input block. DeJule et al. teaches that the light signals received at the inputs of the switch are externally derived linearly polarized optical signal beams (see column 3, lines 44-45). Therefore, one of ordinary skill in the art would have found it obvious to provide linearly polarized optical signal beams to the inputs of the switch, by placing a linear polarizer at the output of the lenses of the optical coupler disclosed by Bellman et al., thereby providing externally derived linearly polarized optical signals as specifically taught by DeJule et al.

Regarding claims 10 and 11; the proposed combination of DeJule et al. and Bellman et al. teaches all of the limitations of claims 10 and 11, except for the output channels comprising output fibers and lenses held and aligned along an output axis in

V-grooves formed in an output block. One of ordinary skill in the art would have recognized that any known, commonly used means could be employed to direct optical signals from the output ports (L_1-L_{12}) of the switch disclosed by DeJule et al. Bellman et al. discloses an optical fiber array comprising optical fibers (16) and lenses (18) for reducing loss of light coupled into or out of the optical fibers by focusing/collimating the light, wherein the optical fibers and lenses are contained within V-grooves on stacked plates/blocks. One of ordinary skill in the art would have found it obvious to use the array of optical fibers disclosed by Bellman et al. to efficiently couple light from the output ports of the switch disclosed by DeJule et al.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Street et al. (US 6,549,691 B1) in view of Bellman et al. (US 2003/0031409 A1).

Regarding claim 8; Street et al. discloses all of the limitations of claim 8, as applied to claim 7 above, except for the fibers and lenses being contained in V-grooves formed in an input block. Bellman et al. discloses a method of aligning optical fibers and lenses in an optical fiber array, comprising optical fibers (16) and lenses (18) for reducing loss of light coupled into or out of the optical fibers by focusing/collimating the light, wherein the optical fibers and lenses are contained within V-grooves on stacked plates/blocks to assure proper alignment of the lenses and fibers, thereby ensuring efficient coupling. One of ordinary skill in the art would have recognized the advantages of using V-grooves to align the mirror and lens arrays disclosed by Street et al. in order to ensure efficient coupling of light into and out of the fiber arrays. Thus, one of ordinary skill in the art would have found it obvious to use blocks with V-grooves to align the

array of optical fibers and array of lenses disclosed by DeJule et al. to efficiently couple light to and from the optical switch disclosed by Street et al.

Allowable Subject Matter

Claims 2, 3, 5, 6 and 13-20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The prior art cited on attached form PTO-892 is the most relevant prior art known, however, the invention of claims 2, 3, 5, 6 and 13-20 distinguishes over the prior art of record for the following reasons.

Regarding claims 2 and 3; the claims are allowable over the prior art of record because none of the references either alone or in combination disclose or render obvious a switch as defined in claim 2, wherein the plurality of Faraday rotator bars are interlaced with a plurality of vertical beam splitter bars in parallel orientation along axes that are *parallel to* output axes of the plurality of output channels in combination with the other limitations of claim 2. Claim 3 depends from claim 2. DeJule et al. (US 5,317,445) discloses Faraday rotator bars interlaced with a plurality of vertical beam splitter bars in parallel orientation along axes that are *perpendicular to* the output axes of the plurality of output channels in Figure 3.

Regarding claims 5 and 6; the claims are allowable over the prior art of record because none of the references either alone or in combination disclose or render obvious a switch as defined in claim 5, wherein the plurality of passive mirrors are

positioned along a plurality of stepped surfaces on the underside of the second layer in combination with the other limitations of claim 5. Claim 6 depends from claim 5.

Regarding claims 13-15; the claims are allowable over the prior art of record because none of the references either alone or in combination disclose or render obvious a switch as defined in claim 13, wherein the coupling matrix layer at each transition node comprises an electro-optic material in combination with the other limitations of claim 13. Claims 14 and 15 depend from claim 13.

Regarding claims 16-20; the claims are allowable over the prior art of record because none of the references either alone or in combination disclose or render obvious a switch as defined in claim 16, comprising first and second identical functional plates comprising a matrix of transmissive blocks having stationary inclined reflective surfaces, *the second plate being positioned above and appropriately shifted to orthogonally align the reflective surfaces of the first and second plates* in combination with the other limitations of claim 16. Claims 17-20 depend from claim 16.

Hence, there is no reason or motivation for one of ordinary skill in the art to use the prior art of record to make the invention of 2, 3, 5, 6 and 13-20.

Conclusion

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Kanterakis et al. (US 5,515,194) discloses an optical interconnect including first and second arrays of beam splitters in Figure 1 and an optical interconnect including a first array of optical reflectors and a second array of beam splitters in Figure 4;

Dorschner et al. (US 5,963,682) discloses an optical beam steering system comprising an input array of optical fibers (12), an input array of collimating lenses (22), an input array of deflection elements (24), an output array of deflection elements (24), an output array of focusing lenses (22) and an output array of fibers (14) in Figure 1;

Bowers et al. (US 6,385,376 B1) discloses a fused vertical coupler for switches and a matrix of input and output waveguides, wherein the output waveguides are located above the input waveguides in Figure 10;

Gomes et al. (US 6,493,483 B2) discloses an integrated circuit photonic signal matrix in Figure 4, comprising input waveguides (90) and output waveguides (92) that are located above the input waveguides, wherein light is received at a detector (20) from an input (N1-N4) and re-emitted from a transmitter (22) towards an output port (M1-M4, see Figure 1);

Takai et al. (JP 59-050689) discloses an optical switch matrix in Figure 1; and

Erman et al. (US 4,773,721) discloses an optical switch matrix in Figure 3.

Any inquiry concerning the merits of this communication should be directed to Examiner Michelle R. Connelly-Cushwa at telephone number (703) 305-5327. Any inquiry of a general or clerical nature (i.e. a request for a missing form or paper, etc.) should be directed to the Technology Center 2800 receptionist at telephone number (703) 308-0956 or to the technical support staff supervisor at telephone number (703) 308-3072.

AKM ENAYET ULLAH
PRIMARY EXAMINER

Michelle R. Connelly-Cushwa
MRCC
April 13, 2003